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GTE ESC
METROLOGY LAB
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RC 1640 BC 305

INSTRUCTION MANUAL

MODEL

INSTRUCTION MANUAL
FOR
TTS 59A-1
PORTABLE MF SENDER

ISSUE 2

APR 71

NORTHEAST ELECTRONICS CORPORATION

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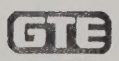
SPECIFICATION TITTLE

METROLOGY CALIBRATION PROCEDURE FOR THE



EQUIPMENT SERVICES CENTER

METROLOGY DEPARTMENT

PRODUCTION ENGINEERING - ESC		
Prepared by		Date
Approved by Equipment Services Superintendetedent		Date
Approved by Equipment Services Manager		Date
Issue	Spec. No. EPC 900.	Sh. 01 of

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ISSUE STATUS SPECIFICATION

EPC 900.

RELATED SPECIFICATIONS	CURRENT ISSUES & STATUS
EPC 900.	
EPC 900. -EPS	N/A
EPC 900. -TRS	N/A
EPC 900. -RPS	N/A
EPC 900. -XRF	N/A
EPC 900. -PSS	N/A
EPC 900.000-CAL	

METROLOGY CALIBRATION PROCEDURE

Prepared by

Technically Validated by

Approved by

STANDARDS LIST

NOTE: The equipment list below reflects the standards recommended by the calibration procedure of the UUT. Devatations from the recommended standards will be documented on this sheet.

RECOMMENDED STANDARDS	STANDARDS USED

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SECTION I

DESCRIPTION & SPECIFICATIONS

1.1 DESCRIPTION. The Model TTS 59A is a small portable unit which permits MF and dial pulse signaling at 6-wire patch bays, toll test boards, etc. when an MF sender is not available. E and M supervisory circuits and a 2- and 4-wire talk circuit are provided.

1.2 The unit contains 6 stable transistorized L-C type oscillators factory set at 700, 900, 1100, 1300, 1500 and 1700 Hz and a mixing amplifier. A key pad with 12 pushbuttons designated 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, DP and ST is located on the front panel. Depression of any one of these keys connects the proper combination of two of the 6 oscillators to the output of the unit.

1.3 A switch designated LEVEL switches the 600Ω output to +1 dB, -6 dB, and -22 dB.

1.4 In addition to the MF Key pad, a dial is provided to permit manual pulsing on an E, M and loop basis. Keys on the front panel permit the testman to send an on hook or off hook toward the line or drop of a circuit. Line and drop lamps are provided to monitor the supervision.

1.5 Jacks for a 52-type headset, connected to a 2- and 4-wire talk circuit, permit the testman to monitor or communicate with the called party.

1.6 The TTS 59A is operated from an external source of 48V dc. An optional accessory, designated TTS 59XPS, can be added in the lid to provide operation on 115V ac. The cover is removable and provides a storage space for power cords, etc.

1.7 A rack-mounted unit, designated the Model TTS 59AR, is also available.

1.8 SPECIFICATIONS

MF OSCILLATORS

Fixed Frequency: 700, 900, 1100, 1300, 1500 and 1700 Hz

Freq. Tolerance: ±1% 40° to 110°F

Harmonic Distortion: 1% 40°-110°F

Output Levels: +1 dB, -6 dB, -22 dB

Output Impedance: 600Ω ±5%

POWER

Central office battery -48V dc 200 mA

Optional: 115V ac if ordered with TTS 59XPS

SIZE

Model TTS 59A - 14"w x 8¾"h x 8"d

Model TTS 59AR - 8¾" x 19" (23" adapters available on request)

WEIGHT: 15 lb.

SECTION 2

OPERATING INSTRUCTIONS

2.1 FRONT PANEL CONTROLS. Fig. 2-1 and Table 2-1 locate and describe the front panel controls of the TTS 59A.

Name of Control	Ref Desig.	Type of Control	Use or Purpose
POWER	S1	Toggle switch	Turns power on and off to unit.
LEVEL	S2	Toggle switch	a. +1 dB switches output level of MF signals to +1 dB. b. -6 dB switches output level of MF signals to -6 dB. c. -22 dB switches output level of MF signals to -22 dB.
KEY PULSE	S3	Key switch	a. DIAL & TALK 2W conditions talk circuit for 2-wire operation. b. SND connects MF oscillators to send jack. c. TALK 4W conditions talk circuit for 4-wire operation.
TWD. D	S4	Key switch	a. ON HK sends on hook toward the drop side. b. OFF HK sends off hook toward the drop side.
TWD. L	S5	Key switch	a. ON HK sends on hook toward the line side. b. OFF HK sends off hook toward the line side.
DIAL	S6	Key switch	a. L sends battery and ground or open pulses on M lead toward the line side under control of dial. b. D sends ground and open pulses on E lead toward the drop side under control of the dial.
MF key pad	S7-S18	Pushbuttons	Provide MF signaling.
ON HK 2W / OFF HK 2W	S19	Turnbutton	a. OFF HK 2W connects hold coil to 2W-4W SND+TALK jack. b. ON HK 2W disconnects hold coil from 2W-4W SND+TALK jack.

TTS 59A

Name of Control	Ref Desig.	Type of Control	Use or Purpose
2W-4W SND+TALK	J1	310-type telephone jack.	Output for sen ses, MF signa signals.
4W REC	J2	310-type telephone jack.	Input for 4-wir
TEL SET 52A	J3/J4	52A twin jack.	For 52-type ha
LINE	J5	310-type telephone jack.	Input from E l M lead on line
DROP	J6	310-type telephone jack.	Input from M E lead on drop
48V	J7	310-type telephone jack.	Operating pow positive and t
TMS	J8	310-type telephone jack.	SND+TALK ja measurement
DIAL		Standard telephone dial.	Provides dial
POWER lamp	DS-1	Indicator lamp	Indicates PO
TWD. L	DS-2	Indicator lamp	Provides mo line side
TWD D	DS-3	Indicator lamp	Provides mo drop side

2.2 OPERATION

2.3 INITIAL STEPS. The following steps should be taken to prepare the set for operation.

a. Unlatch and open the cover. The cover can easily be detached by sliding it to the right.

b. Connect central office battery power (-48V dc tip negative and sleeve positive) using a cord equipped with a 310-type telephone plug on one end and a suitable connection on the other.

NOTE: The power cord should be connected to the TTS 59A before it is connected to the power source. When disconnecting the power cord, detach it from the power supply before detaching it from the 59A.

c. Switch the POWER switch to the ON position. The power indicator lamp will not light if the polarity is reversed.

d. Take all circuits out of service before making tests.

2.4 LOOP DIALING

a. Connect the circuit under test to the 2W 4W SND+TALK jack using a cord equipped with a 310-type telephone plug (tip and ring).

b. Set the KEY PULSE switch to DIAL + TALK 2W.

c. Set the OFF HK 2W/ON HK 2W turnbutton switch to OFF HK 2W.

d. Dial the desired number.

2.5 "M" Lead Dialing - Toward the LINE

a. Connect the LINE and DROP of the circuit under test to the LINE and DROP jacks using a dual 241 type plug.

b. Set the DIAL key switch to L.

c. Set the TWD. L key switch to OFF HK. The TWD. L indicator lamp will light to show an on hook condition on the "E" lead of the circuit.

d. Dialing will send battery and open pulses on the "M" lead of the circuit toward the line. An optional strap may be added to send battery and ground pulses if desired.

e. Setting the TWD. L key switch to ON HK will send an on hook signal on the M lead toward the line.

f. When ground is returned on the "E" lead, the TWD. L lamps will extinguish.

2.6 "E" Lead Dialing - Toward Drop

a. Connect the LINE and DROP of the circuit under test to the LINE and DROP jacks using a dual 241-type plug.

b. Set the DIAL key switch to D.

c. Set the TWD. D key switch to OFF HK. The TWD. D indicator lamp will light to show an on hook condition on the "E" lead of the circuit.

d. Dialing will send ground and open pulses on the "E" lead of the circuit under test toward the drop.

e. Setting the TWD. D key switch to ON HK will send an on hook signal on the "E" lead of the drop.

2.7 MF OPERATION

a. Set the OFF HK 2W/ON HK 2W turnbutton switch to OFF HK 2W.

b. Connect the circuit to be tested to the 2W 4W SND + TALK jack using a 310-type plug (tip and ring).

c. Set the KEY PULSE switch to SND.

SECTION 3

CIRCUIT DESCRIPTION

3.1 GENERAL. The circuit description of the TTS 59A is presented in two parts, the set in general and the MF adapter card, E95148.

3.2 CIRCUIT DESCRIPTION.

3.3 Power is applied to the set through the 48V jack (T=- S=+), the POWER switch and the power reversal protection diode CR1. Resistor R2 and zener diodes CR2 and CR3 act as a voltage divider and regulator circuit for the MF adapter card voltage.

3.4 Toggle switch S2 works in conjunction with resistors R3, R711, R712 and R713 to adjust the MF output level.

3.5 Table 3-2 shows the output frequency combinations transmitted by the MF adapter card by means of switches S7 through S18.

TABLE 3-2 MF GENERATOR

Pushbutton	Frequency
1 (S-8)	700 + 900
2 (S-9)	700 + 1100
3 (S-10)	900 + 1100
4 (S-11)	700 + 1300
5 (S-12)	900 + 1300
6 (S-13)	1100 + 1300
7 (S-14)	700 + 1500
8 (S-15)	900 + 1500
9 (S-16)	1100 + 1500
0 (S-7)	1300 + 1500
KP (S-18)	1100 + 1700
ST (S-17)	1500 + 1700

3.6 Setting the KEY PULSE switch, S3, to the SND position switches the output of the MF adapter to the 2W 4W SND & TALK jack. The output circuit is DC blocked and has an output impedance of 600Ω, but can be changed by the selection of the proper value of resistor R1 on the MF adapter card.

3.7 Setting the KEY PULSE switch, S3, in the DIAL & TALK 2W position connects the talk, send and receive circuits to the 4W SND & TALK jack. Resistor R1 provides voltage dropping for the talk coil while capacitor C1 serves to reduce the impedance from the voltage source. Loop dialing can be accomplished in either the SND or DIAL & TALK 2W positions.

3.8 Setting the KEY PULSE switch, S3, in the TALK 4W position places the talk circuit to 4-wire operation. The transmit pair of the circuit is connected to the 2W 4W SND & TALK jack with capacitor C2 providing DC blocking and the receive pair connected the 4W REC jack.

3.9 The operation of the supervision and dialing circuits can easily be followed with reference to the schematic diagram, Fig. 3-1. The TWD. L and TWD. D indicator lamps, DS2 and DS3 respectively, when illuminated, indicate an on hook condition of the circuits under test.

3.10 The MF Adapter Card E95148

3.11 GENERAL. The MF adapter is a printed circuit plug-in sub-unit designed to generate multi-frequency tones used in telephone transmission and other systems requiring tone signaling. This card contains six individual L-C tuned oscillators, each of which is coupled to a common output amplifier circuit through the individually controlled switching circuits. The control leads from the six switching circuits (gate circuits) are brought to connector terminals to allow external programming of the six frequencies. Logic is included on the card to provide standard MF signaling.

SECTION 4

MAINTENANCE & CALIBRATION

4.1 MAINTENANCE. Little or no maintenance should ever be required for this portable MF sender.

4.2 CALIBRATION. This unit has been carefully calibrated and tested before shipment and should not need recalibration except in cases of age or misuse. If recalibration is required, the following steps should be taken using the recommended equipment shown in Table 4-1.

4.3 Connect a 48V power supply to the 48V jack using a 310-type telephone plug (tip negative, sleeve positive).

4.4 Set the front panel controls of the 59A as follows:

CONTROL	SETTING
POWER	ON
LEVEL	+1 dB
DIAL	Normal
TWD. D	Normal
TWD. L	Normal
ON HK 2W/OFF HK 2W	ON HK 2W
KEY PULSE	SND

Use the above settings except where otherwise noted.

4.5 PROCEDURE

a. Connect an AC Voltmeter to the 2W 4W SND+TALK jack using a 310-type plug (tip and ring).

b. Connect a counter to the AC voltmeter and an oscilloscope to the counter.

c. Connect ground to pin 6 of pc board E95148.

d. Adjust potentiometer R12 on pc board E95148 for a maximum output level.

e. Adjust pot R606 on pc board E95148 for an output level of +5 dB.

f. Adjust variable inductor, L601, for an output frequency of 700 Hz $\pm$1%.

g. Disconnect the ground from pin 6 and connect to pin 7 on same board.

h. Adjust pot R406 on above pc board for an output level of +5 dB.

i. Adjust variable inductor L401 for an output frequency of 900 Hz $\pm$1%.

j. Disconnect the ground from pin 7 and connect to pin 8 on same bd.

TABLE 4-1

DESCRIPTION	MANUFACTURER & MODEL
1. AC Voltmeter	HP 400FL or equivalent.
2. Oscilloscope	Tektronic Type 504 or equivalent.
3. Counter	NEC TTS 80C or equivalent.
4. Power supply	Central office battery or equivalent.

SECTION 5

SCHEMATIC DIAGRAM

5.1 INTRODUCTION. The following pages contain the schematic diagrams for the Model TTS 59A.

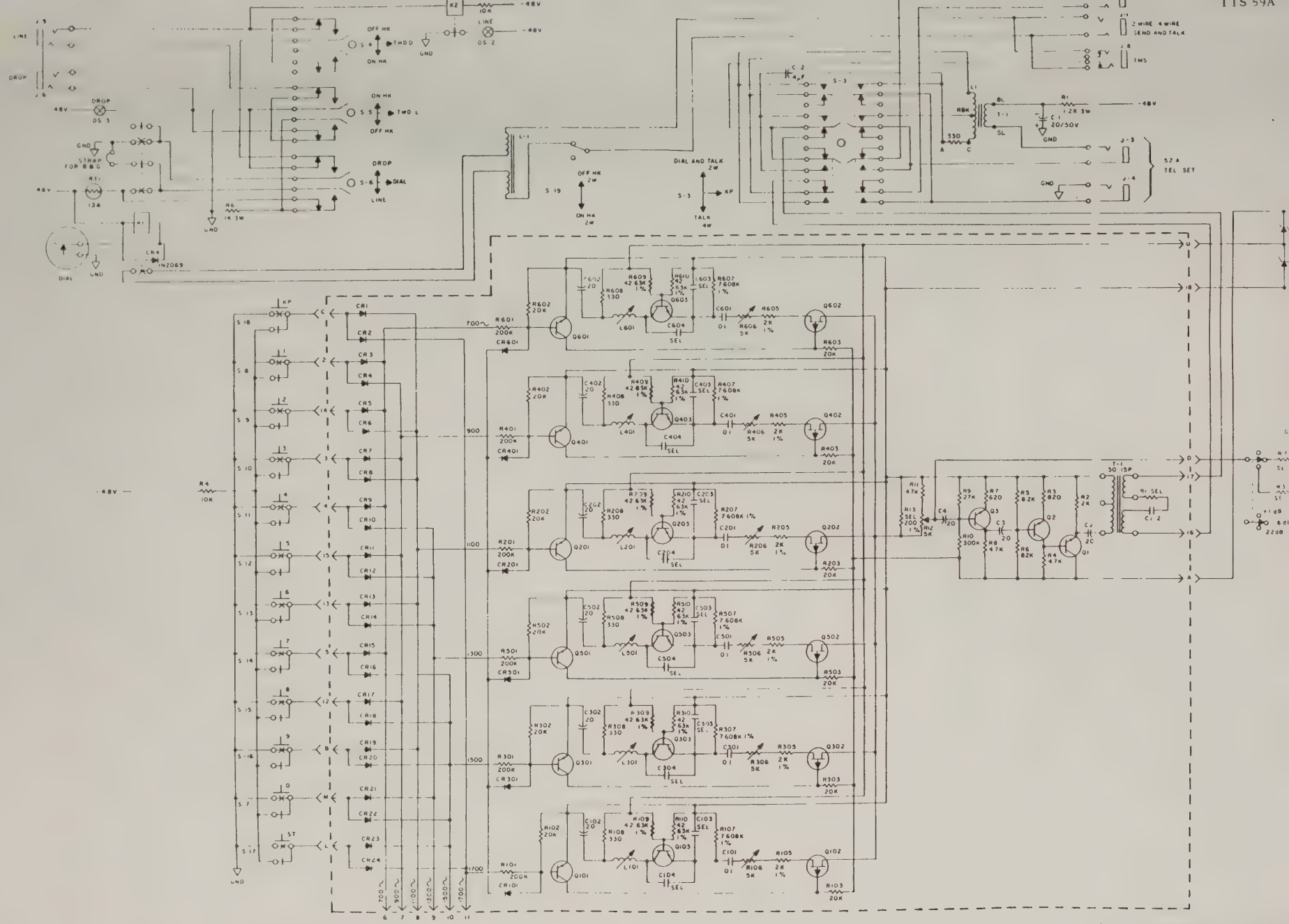


Fig. 5-1 Schematic Diagram

SECTION 6

ELECTRONIC PARTS LIST

6.1 INTRODUCTION. The following pages contain the parts list for the Model TTS 59A.

6.2 FSCM Code Numbers. The Federal Supply Code of Manufacturers of each part. A list of manufacturers and their respective code numbers is listed below.

Code	Manufacturer
01121	Allen Bradley
01295	Texas Instruments
04221	Aemco
06819	NEC
07716	IRC
13606	Sprague
15873	Motorola
24446	General Electric
40009	Arrow-Hart & Hegeman
49671	RCA
71590	Centralab
72619	Dialco
72663	General Control
78277	Potter & Brumfield
80223	UTC
80368	Sylvania
82389	Switchcraft
86151	Ceeco
90201	Mallory
Alco*	No FSCM number listed

PC Board E95148

Ref Desig.	Description	Manufacturer (FSCM Code #)	Part Number
R1 and R13	R: sel val		
R2	R: 2K ±10% ½W	01121	RC20
R3	R: 820Ω ±10% ½W	01121	RC20
R4	R: 4.7K ±10% ½W	01121	RC20
R5	R: 8.2K ±10% ½W	01121	RC20
R6	R: 82K ±10% ½W	01121	RC20
R7	R: 620Ω ±10% ½W	01121	RC20
R8, R11	R: 4.7K ±10% ½W	01121	RC20
R9	R: 27K ±10% ½W	01121	RC20
R10	R: 300K ±10% ½W	01121	RC20
R12	R: 5K pot	90201	MTC-1
C1	C: 2μF 150V	13606	121PZ
C2 thru C4	C: 20μF 50V	13606	TE-1305
CR1 thru CR24	Diodes	80368	1N198
Q1 thru Q3	Transistors	49671	2N2102
T1	Transformer	80223	S0-15P
R101, R201, R301, R401 R501, R601	Resistors: 200K ±10% ½W	01121	RC20
R102, R202, R302, R402, R502, R602	Resistors: 20K ± 10% ½W	01121	RC20
R103, R203, R303, R403, R503, R603	Resistors: 20K ±10% ½W	01121	RC20
R104, R204, R304, R404, R504, R604	Not used		
R105, R205, R305, R405, R505, R605	Resistors: 2.0K	07716	CEATO
R106, R206, R306, R406, R506, R606	Resistors: 5K pot	90201	MTC-1
R107, R207, R307, R407, R507, R607	Resistors: 7.608K ±1% ¼W	07716	CEATO
R108, R208, R308, R408, R508, R608	Resistors: 330Ω ±10% ½W	01121	RC20
R109, R209, R309, R409, R509, R609	Resistors: 42.63K ±1% 1/8W	07716	CEATO
R110, R210, R310, R410, R510, R610	Resistors: 42.63K ±1% ¼W	07716	CEATO
C101, C201 C301, C401, C501, C601	Capacitors: 0.1μF 75V	71590	DDA-104

Ref Desig.	Description	Manufacturers (FSCM Code #)	Part Number
C102, C202, C302, C402, C502, C602	Capacitors: 20μF 50V	13606	TE 1305
C103, C203, C303, C403, C503, C306	Capacitors: sel val		
C104, C204, C304, C404, C504, C604	Capacitors: sel val		
CR101, CR201, CR301, CR401, CR501, CR601	Diodes	80368	1N198
Q101, Q201, Q301, Q401, Q501, Q601	Transistors	49671	2N2102
Q102, Q202, Q302, Q402, Q502, Q602	Transistors, FET	01295	2N3820
Q103, Q203, Q303, Q403, Q503, Q603	Transistors	49671	2N2102

TTS 59A-1

INTRODUCTION

The following pages of blue line copy contain amendments to the TTS 59A manual. This new suplementary information will provide the means to employ the TTS 59A-1 as a useful tool in telephone system work.

PART 1 DESCRIPTION

1.1 GENERAL

1.2 The TTS 59A-1 is identical in function to the TTS 59A with the exception of the following additional features:

(1) Two switched Transmission Measuring Set jacks (TMS jacks) provide parallel access to the two LINE jacks.

(2) The TMS key switch provides the previously mentioned connection between the LINE jacks and the TMS jacks.

(3) The T-R REV (WINK) lamp indicates the presence of a tip to ring reversal on the accessed line.

1.3 The TTS 59A-1 can be ordered with the following optional features:

(1) Option No. 1 is comprised of a toggle and a key switch that provide single frequency signaling features. The S.F. signaling may be dial or continuous and the frequency may be switched to either 2400 Hz or 2600 Hz.

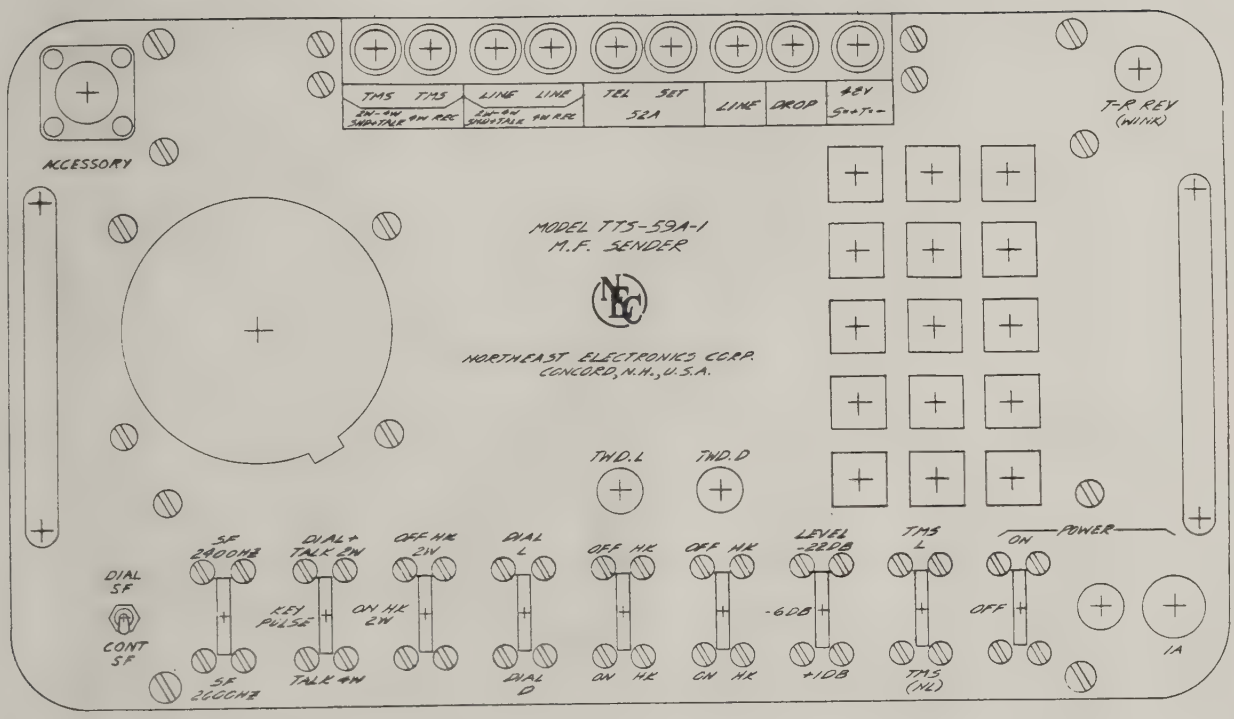
(2) Option No. 2 is comprised of three additional pushbutton switches on the front panel's key pad. These switches provide signals corresponding to CODE 11, CODE 12, and KP2.

PART 2 OPERATION

2.1 OPERATION OF THE TMS FEATURES

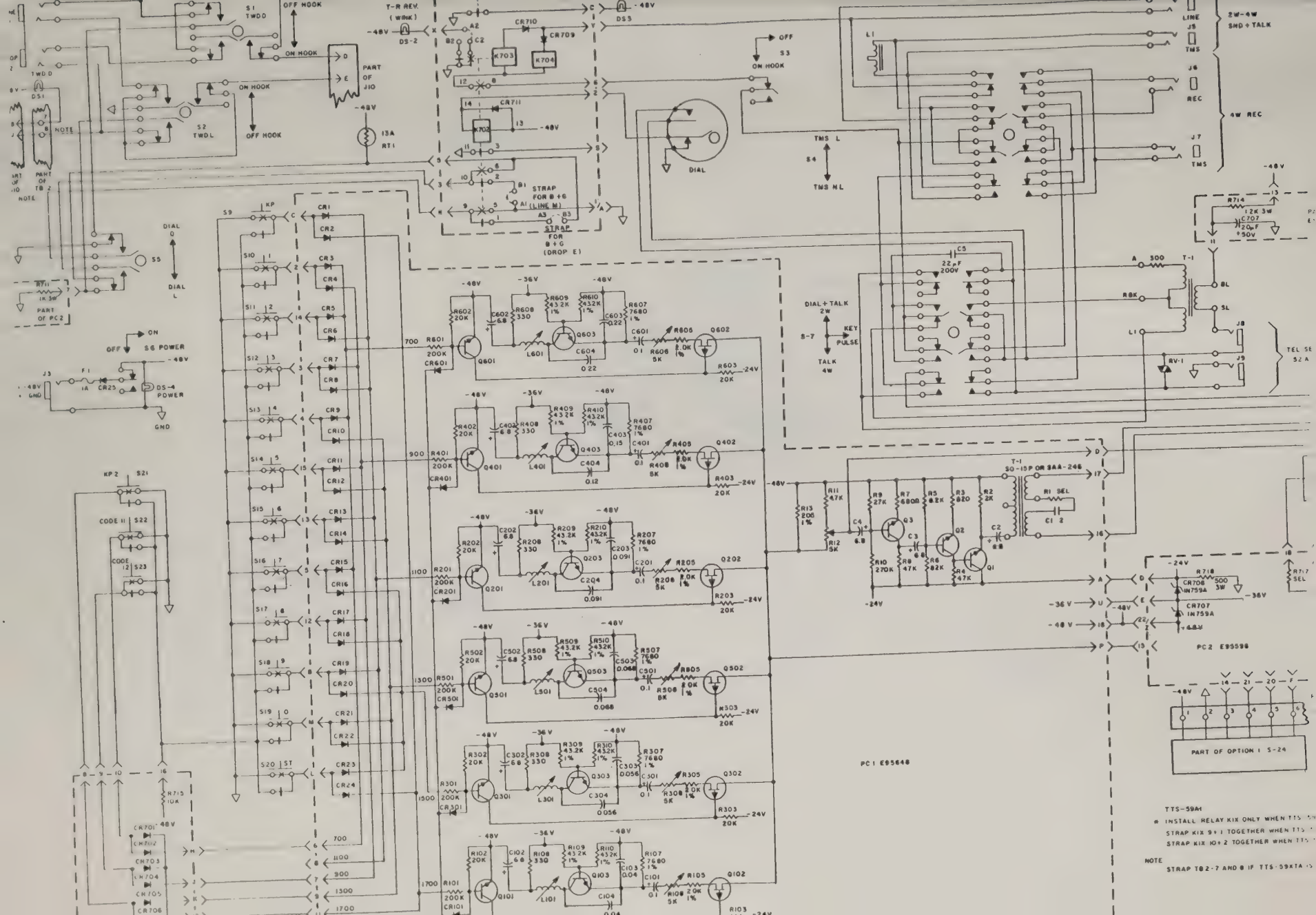
2.2 The TMS jacks can be connected to the LINE jacks continuously or momentarily as determined by the position of the TMS key switch. The TMS-L position is locking and the TMS-NL position is Non-Locking.

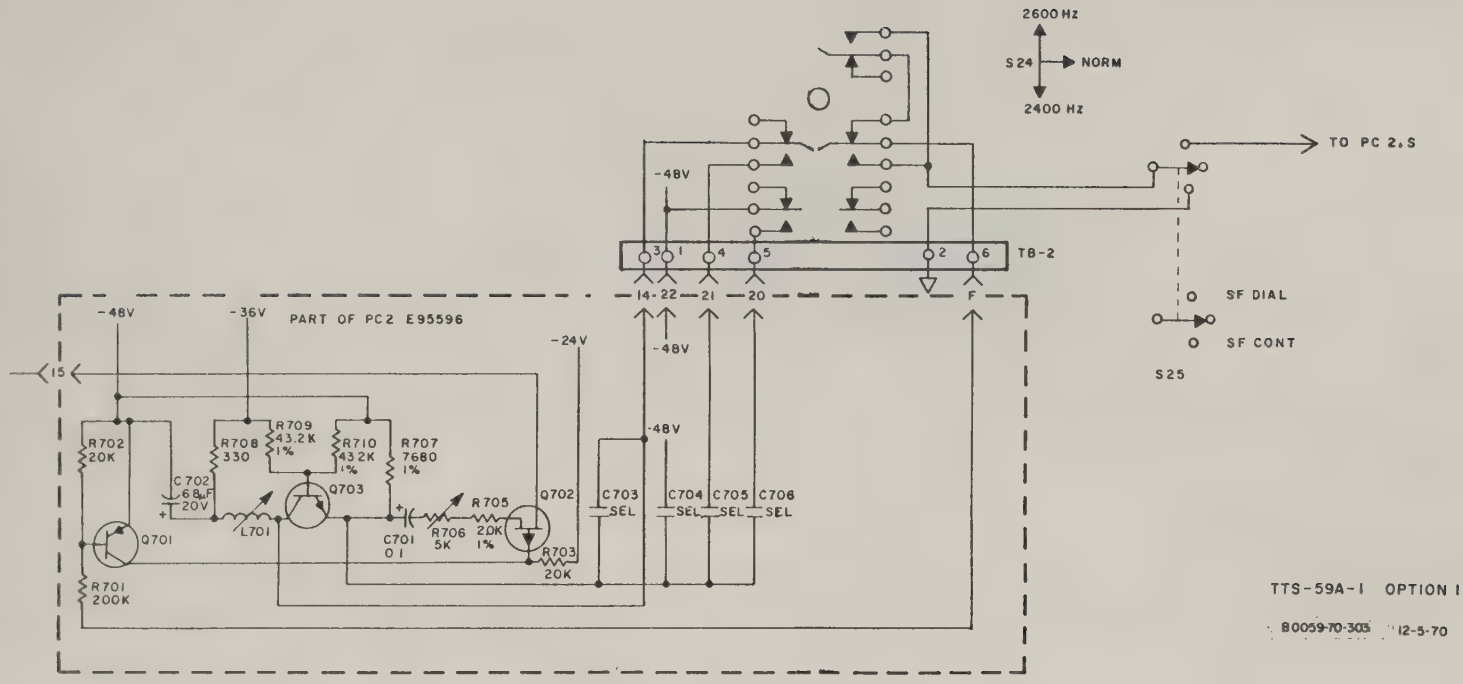
2.3 A hold coil is permanently connected to the TMS 2W-4W SEND+ TALK jack and appears across the LINE 2W-4W SEND + TALK jack as determined by the TMS key switch (refer to paragraph 2.2).

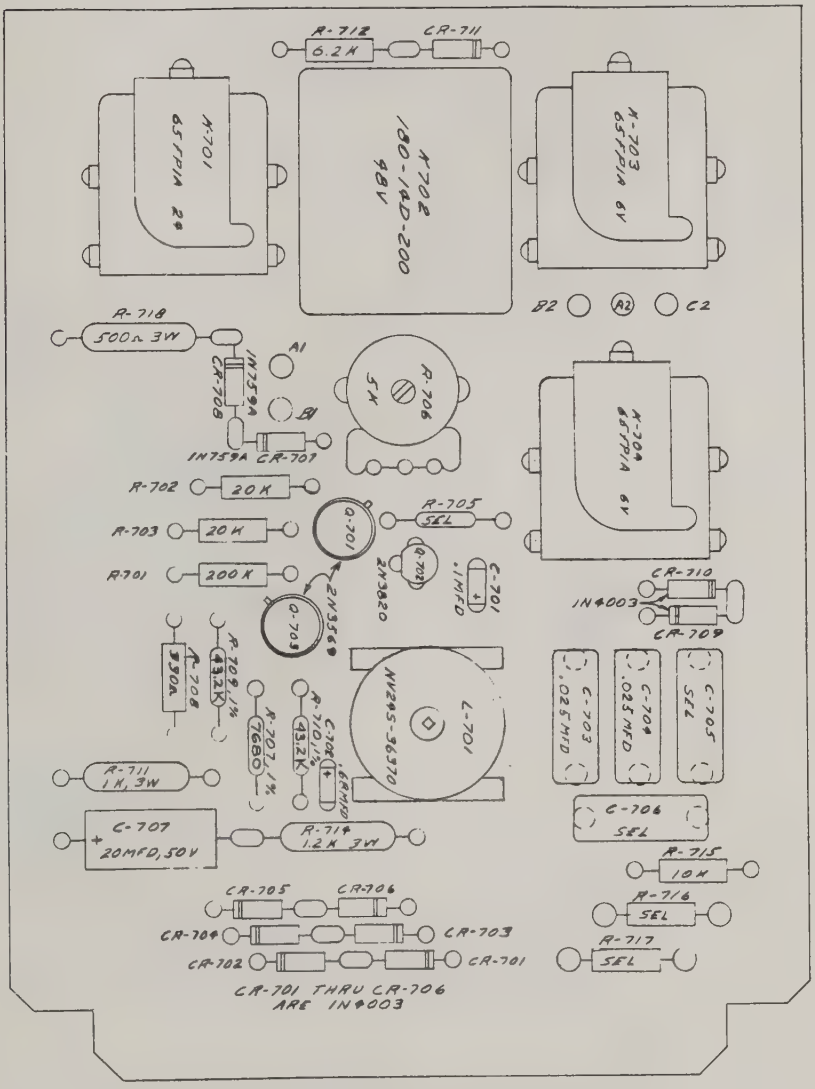


Silk Screen Layout

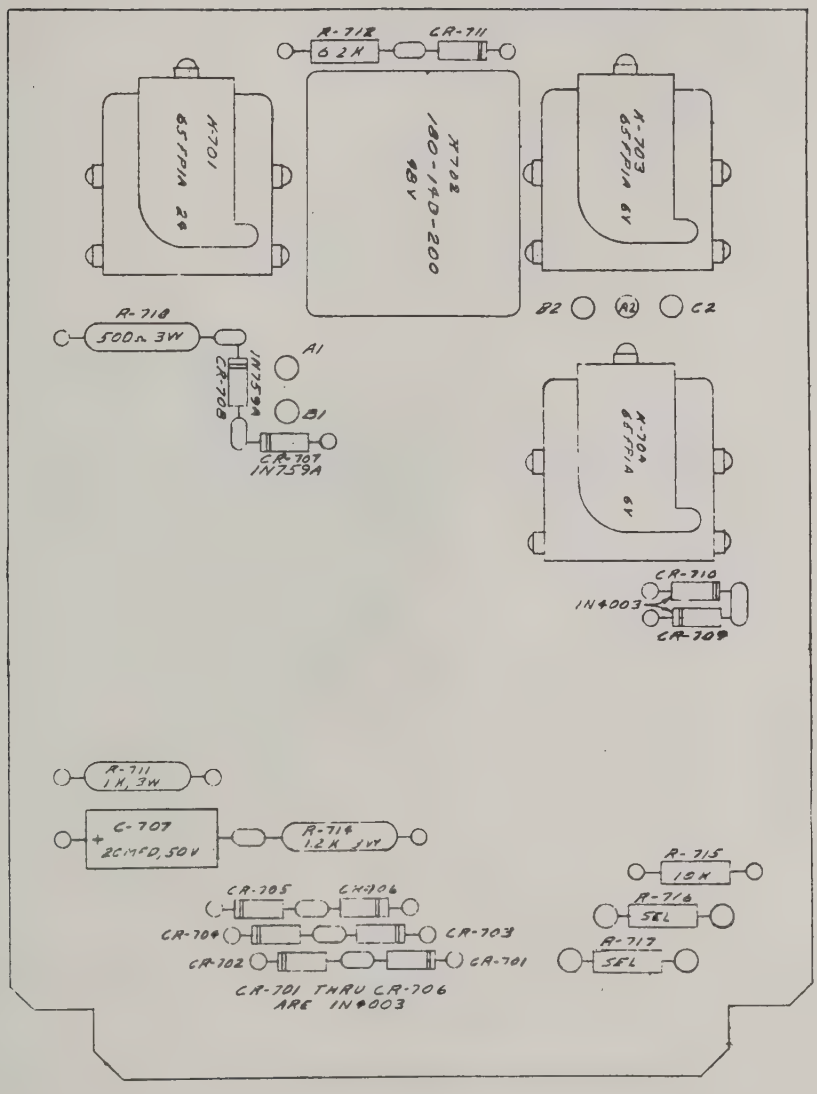
TTS-59A-1


S1 TWDD
OFF HOOK
ON HOOK
S2 TWDL
PART OF J10
-48V
13A RT1
T-R REV. (WINK)
DS-2
DS3
CR710
CR709
K703
K704
CR711
K702
STRAP FOR B+G (LINE M)
STRAP FOR B+G (DROP E)
DIAL
S3
S4
TMS L
TMS M L
L1
LINE J5 TMS
J6 REC
J7 TMS
2W-4W SND+TALK
4W REC
S9 KP
S10
S11
S12
S13
S14
S15
S16
S17
S18
S19
S20 ST
S5
DIAL 0
DIAL L
RV11 1K 3W
PART OF PC2
S6 POWER
DS-4 POWER
F1 1A
CR23
GND
KP2 S21
CODE II S22
CODE 12 S23
CR1
CR2
CR3
CR4
CR5
CR6
CR7
CR8
CR9
CR10
CR11
CR12
CR13
CR14
CR15
CR16
CR17
CR18
CR19
CR20
CR21
CR22
CR23
CR24
700
1100
900
1300
1500
1700
R715 10K
CR701
CR702
CR703
CR704
CR705
CR706
R602 20K
C602 6.8
R608 330
R609 43.2K 1%
R610 432K 1%
R607 7680 1%
C603 0.22
C601 0.1
R605 8.0K 1%
R606 5K
Q602
R603 20K
-24V
L601
C604 0.22
Q601
R601 200K
CR601
R402 20K
C402 6.8
R408 330
R409 43.2K 1%
R410 432K 1%
R407 7680 1%
C403 0.15
C401 0.3
R405 8.0K 1%
R406 5K
Q402
R403 20K
L401
C404 0.12
Q401
R401 200K
CR401
R202 20K
C202 6.8
R208 330
R209 43.2K 1%
R210 432K 1%
R207 7680 1%
C203 0.091
C201 0.1
R205 8.0K 1%
R206 5K
Q202
R203 20K
L201
C204 0.091
Q201
R201 200K
CR201
R502 20K
C502 6.8
R508 330
R509 43.2K 1%
R510 432K 1%
R507 7680 1%
C503 0.068
C501 0.1
R505 8.0K 1%
R506 5K
Q502
R503 20K
L501
C504 0.068
Q501
R501 200K
CR501
R302 20K
C302 6.8
R308 330
R309 43.2K 1%
R310 432K 1%
R307 7680 1%
C303 0.056
C301 0.1
R305 8.0K 1%
R306 5K
Q302
R303 20K
L301
C304 0.056
Q301
R301 200K
CR301
R102 20K
C102 6.8
R108 330
R109 43.2K 1%
R110 432K 1%
R107 7680 1%
C103 0.04
C101 0.1
R105 8.0K 1%
R106 5K
Q102
R103 20K
L101
C104 0.04
Q101
R101 200K
CR101
PC1 E95648
DIAL+TALK 2W
KEY PULSE
TALK 4W
C5 22 mF 200V
300
T-1
RBK
SL
BL
J8
J9
RV-1
TEL SE 52A
T-1 SO-15P OR SAA-246
R1 SEL
C1 2
R11 47K
R9 27K
R7 6800
R5 8.2K
R3 820
R2 2K
R13 205 1%
R12 5K
R10 270K
R8 47K
R6 82K
R4 47K
Q3
Q2
Q1
C4 6.8
C3 6.8
C2 6.8
R714 1.2K 3W
C707 20 mF 50V
R718 500 3W
CR708 1N759A
CR707 1N759A
6.8V
PC2 E95596
PART OF OPTION I S-24
R715 10K
R717 SEL
TTS-59AH
* INSTALL RELAY KIX ONLY WHEN TTS
STRAP KIX 9+1 TOGETHER WHEN TTS
STRAP KIX 10+2 TOGETHER WHEN TTS
NOTE
STRAP TB2-7 AND 8 IF TTS-59KTA


2600 Hz
S24
NORM
2400 Hz
TO PC 2.S
-48V
3
1
4
5
2
6
TB-2
14-22
21
20
F
SF DIAL
SF CONT
S25
PART OF PC2 E95596
-48V
-36V
-24V
15
R702 20K
R708 330
R709 43.2K 1%
R710 432K 1%
R707 7680 1%
C702 68µF 20V
Q703
Q702
R705
Q701
L701
C701 01
R706 5K
20K 1%
R703 20K
R701 200K
C703 SEL
C704 SEL
C705 SEL
C706 SEL
TTS-59A-1 OPTION 1
80059-70-305
12-5-70



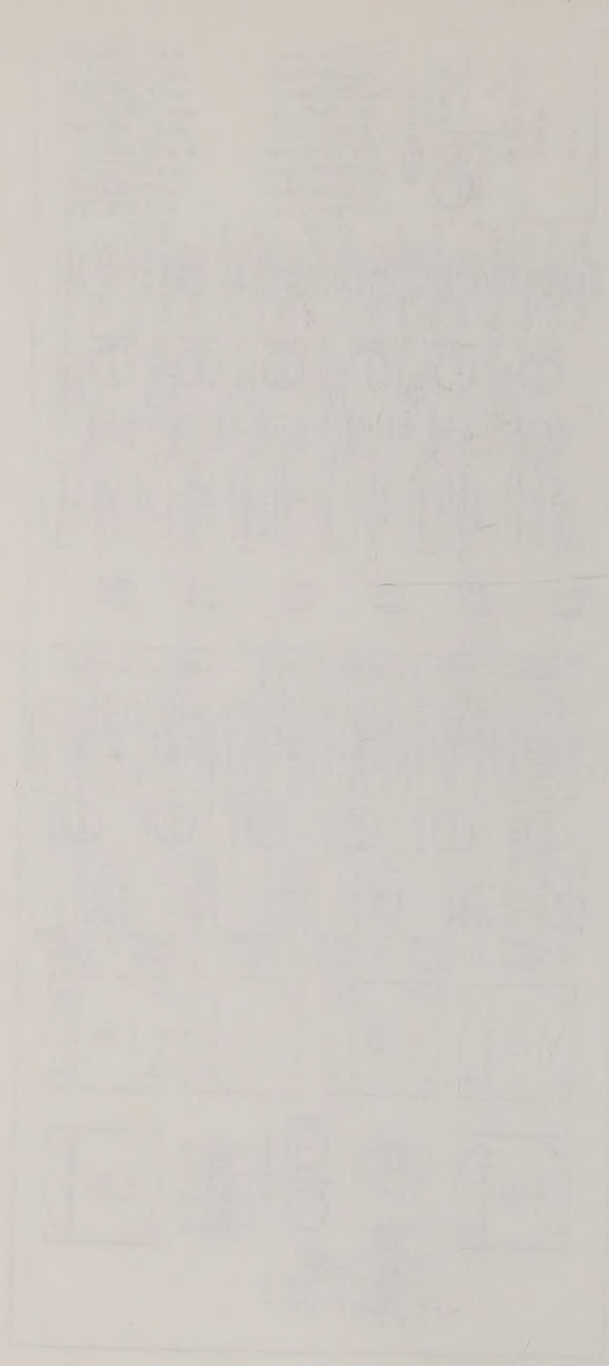
PRACTICAL ASSEMBLY
E-95596-3
CARD #2 WITH OPTION #1
TT5-59A-1

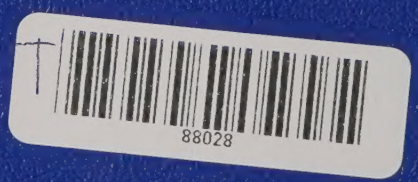


PRACTICAL ASSEMBLY
E-95596-3
CARD #2 WITHOUT OPTION 1

TTS-59A-1

NOTE:
ALL DIODES IN1695
R-3 THRU R-13
1% = 1/8 W
ALL OTHERS 1/4 W
PRACTICAL ASSY.
E-95698
225-598-




88028